the center of a circle of position. And now from this point as center with radius AE (or BE) sweep the circle of position. And in like manner lay down the other circle of position through C and D.

This problem will often be found servicable to the Hydrographer and Explorer when from either accident or necessity only two angles are measured on four objects.

SOLUTIONS OF PROBLEMS IN NO. 6.

Solutions of problems in No. 6 have been received as follows: From Geo. L. Dake, 25 & 26; R. M. DeFrance, 25 & 26; Prof. A. B. Evans, 25, 26, 27 & 29; Henry Gunder, 25, 26, 27 & 29; Wm. Hoover, 26; Prof. A. Hall, 29; H. Heaton, 29; D. J. McAdam, 25 & 26; Esther Matthews, 26; Artemas Martin, 27 & 29; A. W. Phillips, 25, 26, 27 & 29; L. Regan, 25, 26 & 29; R. L. Selden, 25; Werner Stille, 25, 26, 27 & 29; E. B. Seitz, 25, 26, 27 & 29; Prof. J. Scheffer, 26 & 29; Walter Siverly, 27.

25. "Required the sides of an obtuse angled triangle the area of which is 14.048 acres, the obtuse angle 111°15′, and one of the acute angles 11°44′10″."

SOLUTION BY HENRY GUNDER, GREENVILLE, OHIO.

Putting $A = 111°15'$, $B = 11°44'10''$, $C = 57°50''$, and x, y, z or the sides opposite A, B and C, and $a = 14.048$ acres $= 2247.68$ sq. rods.

Since the product of two sides and the sine of the included angle equals twice the area we have,

$$(1)\ xy = \frac{2a}{\sin C},\quad (2)\ xz = \frac{2a}{\sin B},\quad (3)\ yz = \frac{2a}{\sin A}.\quad \text{Then}$$

$$\sqrt{\frac{(1)\times(2)}{(3)}} = (4)\ x = \sqrt{\frac{2a \sin A}{\sin B \sin C}}.\quad \text{Similarly } y = \sqrt{\frac{2a \sin B}{\sin A \sin C}}.$$

$$\text{"}\quad z = \sqrt{\frac{2a \sin C}{\sin A \sin B}}.$$

By applying logarithms, $x = 156.705$ rods, $y = 34.1997$ rods, $z = 141.034$ rods.

26. "Find θ from the equation $15 \sin \theta + 12 \cos \theta = 17.97240$, (1)."

SOLUTION BY WILLIAM HOOVER, SOUTH BEND, IND.

The given equation may be written, $m \sin \theta + n \cos \theta = q$......(2). In (2) put $p \cos \psi = m$ and $p \sin \psi = n$ and it becomes

$$\sin(\theta + \psi) = \frac{q}{p} \ldots\ldots\ldots\ldots (3).$$

$$\text{But } \frac{p \sin \psi}{p \cos \psi} = \tan \psi = \frac{n}{m}. \quad \therefore \psi = 38°39'35''.$$

$$\theta + \psi = \sin^{-1}\frac{q}{n} \sin \psi = 69°19'35''. \qquad \therefore \theta = 30°40',$$

---

27. "Four given equal spheres being placed in close contact with each other, it is required to find the volume of the space inclosed between them and the four triangular planes drawn respectively through each three centers."

SOLUTION BY E. B. SEITZ, GREENVILLE, O.

Let $r =$ the radius of each sphere. Then $\frac{2}{3}r^3\sqrt{2} =$ the volume of the tetraedron formed by the four planes, and $\frac{4}{3}(3\cos^{-1}\frac{1}{3} - \pi)r^3 =$ the volume of the four equal spherical sectors cut from the spheres by the planes.

Hence, the required volume is

$V = \frac{2}{3}r^3\sqrt{2} - \frac{4}{3}(3\cos^{-1}\frac{1}{3} - \pi)r^3 = \frac{2}{3}r^3(\sqrt{2} + 2\pi - 6\cos^{-1}\frac{1}{3}) = .20775r^3$.

[For want of room we are obliged to defer publishing the solution of 29 till next month.]

PROBLEMS.

34. BY PROF. M. L. COMSTOCK, GALESBURG, ILL.—Given $xyz = 18$, (1); $x^2 + y^2 + z^2 = 33$, (2); $(x^2 - yz)^3 + (y^2 - xz)^3 + (z^2 - xy)^3 - 3(x^2 - yz)(y^2 - xz)(z^2 - xy) = 6561$, (3); to find x, y and z.

35. BY CAPT. O. E. MEIBAELIS, PITTSBURGH, PA.—A man let a stone weighing 40 lbs. to a neighbor—the latter broke it accidentally into four parts—and upon returning the fragments consoled the owner by remarking that now he could weigh all numbers between one and forty. In other words, given $a + b + c + d = 40$, to determine such values for a, b, c and d, as will, by *association*, produce all numbers from one to forty.

36. BY HENRY A. ROLAND, TROY, N. Y.—A perfectly flexible cord of given length is suspended from two points whose coordinates are x', y' and x'', y''. How must the weight of the cord vary from point to point in order that it may hang in the arc of a circle.